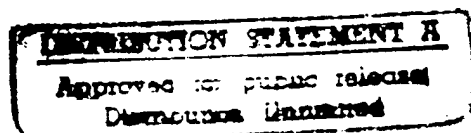


**THERMOACOUSTICS REVIEW MEETING
13-15 NOVEMBER 1996
ASILOMAR CONFERENCE CENTER
PACIFIC GROVE, CA**

The Jamie Whitten National Center for Physical Acoustics



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*The
University of Mississippi*

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PACIFIC GROVE, CA**

**Proceedings of a Symposium Sponsored by the
Office of Naval Research
Grant Number N00014-97-1-0103**

**Compiled by
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**THERMOACOUSTICS REVIEW MEETING
ASILOMAR CONFERENCE CENTER
NOVEMBER 13-15, 1996**

PREFACE

The purpose of the Thermoacoustic Review Meeting (TARM) was to succinctly review the Office of Naval Research basic (6.1) work in the Thermoacoustic Cooling program and to hold a meeting for extended discussions and some related presentations. The participants included the ONR Thermoacoustic Cooling program Principal Investigators, colleagues, ONR Headquarters reviewers, and other invited appropriate Navy and other participants.

TARM was held November 13-15, 1996 at the Asilomar Conference Center, a California State Park facility in Pacific Grove California, on the Pacific Ocean near Monterey, California. One reason for selecting the Asilomar site was to convene near a place where there is on going thermoacoustics research. On the afternoon of Thursday 4 November, there was an opportunity to visit some thermoacoustics research facilities at the Naval Postgraduate School in nearby Monterey California.

The ONR funded presenters were asked to tell participants, including some without a thermoacoustic background, what they have tried to do, what they have done, how it relates to other thermoacoustic work, why it is important, what are the unresolved issues, and what are their plans. Similar guidelines applied for presenters not in the ONR 6.1 Thermoacoustic Cooling Program. Specifically those participants representing potential users were asked to comment on the potential application of thermoacoustic cooling in the fleet.

The Asilomar review proved to foster extended discussion outside the scheduled sessions. The organizers are grateful to the participants who made this meeting effective and the professional staff at Asilomar.

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SYNOPSIS OF MEETING

Each presenter provided copies of overhead transparencies used for his/her presentation. Copies may be obtained by contacting the appropriate individual listed under the Availability section below. Unavailable from the authors are comments from the potential users represented by Dr. Frank Stone, Mr. Bruce Unkel, and Mr. Daniel Winegrad. Some of their comments are summarized in the following.

The Navy strives to protect the environment and to abide by international treaties and connections. The Navy has undertaken large programs to eliminate the use of CFC's in the fleet. Expensive and extensive retrofits have changed most air-conditioners to CHFC's as refrigerants. Even as the conversions take place, there is a recognition that CHFC's may be phased out in the next decade. An alternative will be required when that time arrives and thermoacoustics appear promising.

The cooling requirements on a ship are staggering -- hundreds of thousands of tons. A reasonable starting point for thermoacoustics might be supplemental, stand alone units. Three ton "window" units are common. Perhaps a thermoacoustic replacement would be feasible both in cooling requirements and compactness.

LIST OF PRESENTATIONS

Thermoacoustics Basics

Anthony A. Atchley, Naval Postgraduate School

Shipboard Heat-Driven Thermoacoustic Coolers

Thomas Hofler, Robert Keolian and Anthony Atchley, Naval Postgraduate School

Radial Wave Thermoacoustic Engines

W. Patrick Arnott, Desert Research Institute; Richard Raspet, Jay Lightfoot and Henry E. Bass, University of Mississippi

Heat-Driven Thermoacoustic Coolers

Richard Raspet, Henry E. Bass, James Brewster, Gordon Smith and Jay Lightfoot, University of Mississippi

Mechanically-Driven Thermoacoustic Coolers

Steven L. Garrett, Pennsylvania State University

Small Mechanically-Driven Thermoacoustic Coolers

Orest G. Symko, University of Utah

Thermo-Fluid Mechanic Study of Thermoacoustic Devices

Andrea Prosperetti, Omar Knio and Cila Herman, John Hopkins University

Anisotropic Heat-Exchanger/Stack Configurations for Thermoacoustic Heat Engines

Jay D. Maynard, Pennsylvania State University

Properties of Thermoacoustic Working Gases[†]

Michael R. Moldover and Keith A. Gillis, NIST-Gaithersburg

Thermoacoustics under Water (THAW)

B. Gabrielson, Pennsylvania State University; William C. Ward, Los Alamos National Laboratory; and Steven C. Black, NRL Orlando

TRITON Thermoacoustic Cooler^{††}

Steven L. Garrett, Pennsylvania State University

Magnetically Enhanced Thermoelectric Cooling and a New Approach to the Materials Problem

Albert Migliori, S.A. Trugman, T.W. Darling, and M.F. Hundley, Los Alamos National Laboratory; J.L. Sarrao, Florida State University; Z. Fish, NHMFL

Optimizing the Design of Thermoacoustic Cooling Systems

B.L. Minner, J.E. Braun and L. Mongeau, Purdue University

OTHER MATERIALS

Design Optimization of Thermoacoustic Refrigerators

Martin Wetzel and Cila Herman, Johns Hopkins University

Design Issues of a Thermoacoustic Refrigerator and Its Heat Exchangers

Martin Wetzel and Cila Herman, Johns Hopkins University

Expanding the Applications of Holographic Interferometry to the Quantitative Visualization of Oscillatory Thermofluid Processes using Temperature as Traces

Cila Herman, Eric Kang and Martin Wetzel, Johns Hopkins University

Properties of Working Fluids for Thermoacoustic Refrigerators (Annual Report to ONR)

Michael R. Moldover and Keith A. Gillis, NIST-Gaithersburg

Practical Determination of Gas Densities from the Speed of Sound Using Square-Well Potentials

K.A. Gillis and Michael R. Moldover, NIST-Gaithersburg

AVAILABILITY

Unless otherwise noted, all presentations and other materials are available in plain paper copies from Libby Cauthen, NCPA, University of Mississippi, University MS 38677; 601-232-5808 (voice), 601-232-7494 (fax), eacauthe@olemiss.edu.

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††Available from Steven L. Garrett, Applied Research Laboratory, Pennsylvania State University, P.O. Box 30, State College PA 16804; 814-863-6373 (voice), 814-865-3119 (fax), garrett@sabine.acs.psu.edu

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REPORT DOCUMENTATION PAGE			Form Approved OMB No. 0704-0188	
Public reporting burden for this collection of information is estimated to average 1 hour per response, including the time for reviewing instructions, searching existing data sources, gathering and maintaining the data needed, and completing and reviewing the collection of information. Send comments regarding this burden estimate or any other aspect of this collection of information, including suggestions for reducing this burden, to Washington Headquarters Services, Directorate for Information Operations and Reports, 1215 Jefferson Davis Highway, Suite 1204, Arlington, VA 22202-4302, and to the Office of Management and Budget, Paperwork Reduction Project (0704-0188), Washington, DC 20503.				
1. AGENCY USE ONLY (Leave blank)	2. REPORT DATE 4 Apr 97	3. REPORT TYPE AND DATES COVERED Final 01 Nov 96 - 31 May 97		
4. TITLE AND SUBTITLE Thermoacoustic Review Meeting		5. FUNDING NUMBERS PE 61153N G N00014-97-1-0103		
6. AUTHOR(S) H.E. Bass and E.A. Cauthen				
7. PERFORMING ORGANIZATION NAME(S) AND ADDRESS(ES) NCPA UNIVERSITY OF MISSISSIPPI UNIVERSITY, MS 38677		8. PERFORMING ORGANIZATION REPORT NUMBER		
9. SPONSORING/MONITORING AGENCY NAME(S) AND ADDRESS(ES) OFFICE OF NAVAL RESEARCH ONR 331 800 NORTH QUINCY STREET ARLINGTON VA 22217-5660		10. SPONSORING/MONITORING AGENCY REPORT NUMBER		
11. SUPPLEMENTARY NOTES Executive summary of the Thermoacoustic Review Meeting held 13-15 Nov 96 at the Asilomar Conference Center, Pacific Grove, CA.				
12a. DISTRIBUTION / AVAILABILITY STATEMENT Approved for public release: Distribution unlimited		12b. DISTRIBUTION CODE		
13. ABSTRACT (Maximum 200 words) The purpose of the Thermoacoustic Review Meeting (TARM) was to succinctly review the Office of Naval Research basic (6.1) work in the Thermoacoustic Cooling program and to hold a meeting for extended discussions and some related presentations. The participants included the ONR Thermoacoustic Cooling program Principal Investigators, colleagues, ONR Headquarters reviewers, and other invited appropriate Navy and other participants.				
14. SUBJECT TERMS Thermoacoustics, Thermoacoustic Cooling, Environment, Shipboard Cooling		15. NUMBER OF PAGES 8		
		16. PRICE CODE		
17. SECURITY CLASSIFICATION OF REPORT Unclassified	18. SECURITY CLASSIFICATION OF THIS PAGE Unclassified	19. SECURITY CLASSIFICATION OF ABSTRACT Unclassified	20. LIMITATION OF ABSTRACT	